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Review of New Source Performance Standards for Secondary Brass and Bronze Plants

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This report presents the findings of the second 4-year review of the new source performance standard for secondary brass and bronze production plants. Information is presented concerning industry growth, control technology, compliance status, and the costs associated with compliance.

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Review of New Source Performance Standards for Secondary Brass And Bronze Plants

Emission Standards and Engineering Division

U.S. ENVIRONMENTAL PROTECTION AGENCY
Office of Air and Radiation
Office of Air Quality Planning and Standards
Research Triangle Park, North Carolina 27711

May 1984

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1. EXECUTIVE SUMMARY

1.1 REGULATORY HISTORY OF CURRENT STANDARD

The new source performance standards (NSPS) for secondary brass and bronze ingot production plants were proposed on June 11, 1973, and promulgated by the Environmental Protection Agency (EPA) on March 8, 1974 (40 CFR 60, Chapter 1, Subpart M). The secondary brass and bronze NSPS applies to reverberatory and electric furnaces of 1,000 kg (2,205 lb) or greater production capacity and to blast (cupola) furnaces of 250 kg/h (550 lb/h) or greater production capacity that were constructed or modified on or after June 11, 1973. The standards state that exhaust gases discharged to the atmosphere from reverberatory furnaces must not contain particulate matter in excess of 50 mg/dscm (0.022 gr/dscf) and must not exhibit 20 percent opacity or greater. The standards also state that exhaust gases from electric and blast (cupola) furnaces must not exhibit 10 percent opacity or greater.

The objective of this report is to review the NSPS for secondary brass and bronze ingot production plants and to assess the need for revision on the basis of developments that have occurred since the original NSPS was promulgated in 1974 and since the last review in 1979. The following paragraphs summarize the results and conclusions of the review.

1.2 INDUSTRY OUTLOOK

In 1973, approximately 258,500 Mg (285,000 tons) of brass and bronze ingot were produced at 60 plants. By 1982, production had declined to 154,200 Mg (170,000 tons), and 37 plants were in operation. Despite this decline, five rotary reverberatory furnaces and one electric induction furnace have been installed since the NSPS was proposed and are therefore

subject to its provisions. Most of this growth has occurred since the NSPS was reviewed in 1979; only two reverberatory furnaces were reported subject to the NSPS in 1979. No blast (cupola) furnaces have become subject to the NSPS. No furnaces of any type have become subject to the NSPS through modification or reconstruction.

Growth in the number of affected reverberatory and electric furnaces is expected to continue. These new furnaces will absorb capacity lost when plants close; provide production flexibility to make plants more competitive; replace outdated, inefficient equipment; and provide production facilities near market areas. No new blast (cupola) furnaces are expected. The notably high growth projections in the number of electric induction furnaces reflects the development of a new process in which brass is continuously cast from an electric furnace in the form of a strip.

1.3 BEST DEMONSTRATED CONTROL TECHNOLOGY (BDT)

The original standard was based on the use of fabric filter control technology to control emissions from reverberatory furnaces captured during charging and melting. No significant changes have occurred in control technology for the affected sources. Wet scrubbers typically are unable to provide the level of control required under the NSPS and have problems with water pollution and solid waste generation. Electrostatic precipitators (ESP's) have difficulty in collecting metal oxides because of the relatively high resistivity of such particles. Therefore, fabric filters continue to be considered BDT.

Some emissions generated during charging and tapping of reverberatory furnaces escape capture and control. No mass emission data are available for these emissions. However, visible emissions observations made during this review indicate that these emissions are not significant. Therefore, no BDT has been identified for control of these emissions.

Compliance test results, State and local control agency inspection reports, and unofficial observations made during plant visits in this review show all operating NSPS facilities are in compliance with the NSPS.

1.4 COMPLIANCE TEST DATA

The furnaces subject to the NSPS at four of the five plants are the rotary reverberatory type; the fifth plant has an electric induction furnace. One of the rotary furnaces subject to the NSPS has not been placed in operation and has not been tested for compliance. The other four rotary furnaces have been tested and are currently in compliance with the 50 mg/dscm (0.022 gr/dscf) particulate emission standard and the 20 percent opacity limit set in the NSPS. The electric furnace has been tested and is currently in compliance with the 10 percent opacity limit set for electric furnaces and the particulate emission rate set for reverberatory furnaces in the NSPS.

One electric furnace not currently subject to the NSPS was tested and found to have a particulate emission rate below the standard set for reverberatory furnaces.

1.5 ECONOMIC CONSIDERATIONS AFFECTING THE NSPS

To estimate the economic consequences of the NSPS, model plant descriptions were developed based on representative NSPS plants to serve as a basis for estimating costs. The capital and annualized costs for the control system for each model plant were estimated using guidelines in the GARD Manual and information supplied by industry. Costs were updated to December 1982 dollars using the Chemical Engineering plant cost index.

The average cost effectiveness of particulate matter control for reverberatory furnaces is $135 per ton over uncontrolled emission levels, and the average cost effectiveness of particulate matter control for electric furnaces is $1,500 per ton over uncontrolled emission levels. An analysis of the economic impact of the NSPS on the brass and bronze industry indicates that the rate of decline in the total industry had not been accelerated by the NSPS and that the control cost associated with the NSPS has resulted in a maximum product price increase of only 0.4 percent.

2. INDUSTRY DESCRIPTION

2.1 INTRODUCTION

On June 11, 1973, the EPA proposed new source performance standards for the secondary brass and bronze industry. These standards established particulate matter emission limits and required testing and reporting of particulate matter and visible emissions for affected facilities that were built, reconstructed, or modified on or after June 11, 1973. The facilities affected by these regulations are reverberatory, electric, and blast (cupola) furnaces.

At the time of NSPS development, there were approximately 60 secondary brass and bronze ingot production plants operating throughout the United States with the majority located in the northeast and north central industrial belts.[1] The yearly production of ingot from these plants was approximately 272,000 Mg (300,000 tons).[1] The secondary brass and bronze industry was selected for NSPS development because individual facilities can be significant sources of particulate matter emissions. Uncontrolled reverberatory furnaces can emit as much as 32 kg of particulate matter per Mg (70 lb/ton) of metal produced.[2] The mass rate of particulate matter emissions from blast (cupola) furnaces is approximately equal to that from reverberatory furnaces; the mass rate of particulate matter from electric furnaces is typically far lower than that from reverberatory or blast.[2] An uncontrolled 45-Mg (50-ton) capacity, rotary reverberatory furnace is capable of emitting 1,300 Mg/yr (1,440 tons/yr) of particulate matter.[3] The NSPS limits these emissions to approximately 11 Mg/yr (12 tons/yr).[3]

The Clean Air Act Amendments of 1977 require that the EPA Administrator review NSPS at least every 4 years to assess the need for possible revision of standards [Section 111(b)(1)(B)].[4] This report presents the

findings of the second review of the NSPS for the secondary brass and bronze industry. The review was conducted by examination of current secondary brass and bronze literature, discussions with regional EPA offices and State and local air pollution control agencies, discussions with emission control equipment vendors, visits to new and modified secondary brass and bronze facilities, and discussions with brass and bronze ingot trade associations.

2.2 BACKGROUND INFORMATION

Secondary brass and bronze plants generally produce brass and bronze ingots weighing 13.6 kg (30 lb).[5-9] However, there is a new process, associated with electric induction furnaces, for continuously casting the product in the form of rod rather than ingot. This technology makes possible the continuous rolling of strip significantly faster than by other processes. Classically, when copper is alloyed with zinc, the product is termed brass, and when copper is alloyed with tin, the product is termed bronze. Other copper alloys are identified by the alloying metals such as aluminum bronze and silicon bronze. Table 2-1 lists the 12 categories of brass and bronze that have been designated by the Brass and Bronze Ingot Institute. The table also shows subcategories of the alloys along with the chemical specifications and characteristics of each.

Because of their high strength, workability, corrosion resistence, and other desirable physical characteristics, the copper-base alloys are used in a wide variety of products found in the marketplace. Table 2-2 lists the principal categories of end uses for brass and bronze.

2.3 BRASS AND BRONZE PRODUCTION

2.3.1 Industry Characterization

Secondary brass and bronze companies are usually small, individually owned firms consisting of one plant. A few are subsidiary operations of large mining companies or of conglomerates.[10]

Currently, 37 secondary brass and bronze plants are in operation; these plants are listed in Table 2-3. Of these plants, five have facilities that are subject to the NSPS. Table 2-4 lists these five plants and gives a brief description of the affected facilities. Two of the five

TABLE 2-1. BRASS AND BRONZE ALLOYS, CHEMICAL SPECIFICATIONS, AND PRODUCT CHARACTERISTICS[11,12]

Alloy No.	Classification	Cu, %	SN, %	Pb, %	Zn, %	Fe, %	AL, %	Ni, %	Si, %	Mn, %	Characteristics
1A	Tin bronze	88.0	10.0		2.0						Corrosion resistent; good for casting.
1B	Tin bronze	88.0	8.0		4.0						
2A	Leaded tin bronze	88.0	6.0	1.5	4.0						
2B	Leaded tin bronze	87.0	8.0	1.0	4.0						
2C	Leaded tin bronze	87.0	10.0	1.0	2.0						
3A	High-lead tin bronze	80.0	10.0	10.0							Malleable; readily machined.
3B	High-lead tin bronze	83.0	7.0	7.0	3.0						
3C	High-lead tin bronze	85.0	5.0	9.0	1.0						
3D	High-lead tin bronze	78.0	7.0	15.0							
3E	High-lead tin bronze	71.0	5.0	24.0							
4A	Leaded red brass	85.0	5.0	5.0	5.0						Inexpensive, corrosion-resistant, good for casting and machining (useful for water systems).
4B	Leaded red brass	83.0	4.0	6.0	7.0						
5A	Leaded semi-red brass	81.0	3.0	7.0	9.0						
5B	Leaded semi-red brass	76.0	2.5	6.5	15.0						
6A	Leaded yellow brass	72.0	1.0	3.0	24.0						Moderately strong; easily machines and polishes.
6B	Leaded yellow brass	67.0	1.0	3.0	29.0						
6C	Leaded yellow brass	61.0	1.0	1.0	37.0						
7A	Manganese bronze	59.0	1.0	1.0	37.0	1.0	0.6			0.5	High tensile strength; corrosion-resistant to sea water.
8A	Hi-strength manganese bronze	57.5			39.0	1.0	1.0			1.5	
8B	Hi-strength manganese bronze	64.0			24.0	3.0	5.0			3.5	
8C	Hi-strength manganese bronze	64.0			24.0	3.0	5.0			3.5	
9A	Aluminum bronze	88.0				3.0	9.0				High tensile strength and hardness resistant to fatigue and high temperature.
9B	Aluminim bronze	89.0				1.0	10.0				
9C	Aluminum bronze	85.0				4.0	11.0	2.0		0.5	
9D	Aluminum bronze	81.0				4.0	11.0	4.0		3.0	
10A	Leaded nickel brass	57.0	2.0	9.0	20.0			12.0			Excellent mechanical properties; tarnish and corrosion-resistant.
10B	Leaded nickel brass	60.0	3.0	5.0	16.0			16.0			
11A	Leaded nickel bronze	64.0	4.0	4.0	8.0			20.0			
11B	Leaded nickel bronze	66.5	5.0	1.5	2.0			25.0			
12A	Silicon bronze	88.0			5.0	1.5			4.0	1.5	Good for casting (leaves a clean casting surface).
12B	Silicon brass	82.0			14.0				4.0		

TABLE 2-2. END USES OF BRASS AND BRONZE[5-10,13]

- Housing industry
  - Plumbing and heating equipment
  - Valves and pipe fittings
  - Electrical housewares
  - Lighting and wiring equipment
  - Ornamentation
  - Refrigeration machinery
- Transportation industry
  - Engines and turbines
  - Aircraft
  - Ships and boats
- Consumer goods
  - Electric motors and generators
  - Musical instruments
  - Photographic equipment
  - Office and computing equipment
- Military
  - Ordnance
  - Signal equipment
- Other
  - Construction and mining equipment
  - Industrial machinery
  - Medical equipment
  - Grave markers

TABLE 2-3. PRODUCERS OF BRASS AND BRONZE, FEBRUARY 1983[10,14,15]

1. American Brass Incorporated, P.O. Box 185, Headland, Alabama 36345
2. ASARCO Incorporated, San Francisco, California
3. The G.A. Avril Company, Brass & Bronze Ingot Division, Box 66 Winton Place Station, 4445 Kings Run Drive, Cincinnati, Ohio 45232
4. Bay State Refining Company, Incorporated, P.O. Box 269, Chicopee, Massachusetts 01021
5. Belmont Smelting & Refining Works, Incorporated, 330 Belmont Avenue, Brooklyn, New York 11207
6. Bohn Aluminum and Brass, Adrian, Michigan
7. Bridgeport Brass, Indianapolis, Indiana
8. Brush Wellman Incorporated, 17876 St. Clair Avenue, Cleveland, Ohio 44110--Elmore, Ohio Plant
9. W.J. Bullock, Incorporated, Box 539, Fairfield, Alabama 35064
10. Harry Butter & Company, Incorporated, 151 Mt. Vernon Street, Dorchester, Massachusetts 02125
11. Cabot Berylco Industries, Incorporated, Alloy Division, P.O. Box 1462, Reading, Pennsylvania 19603
12. Cerro Metals, Newark, California
13. Cerro Metals, Bellefonte, Pennsylvania 16823
14. Chase Brass and Copper, Montpelier, Ohio
15. Chase Brass and Copper, Solon, Ohio
16. Chicago Extruding Metals, Chicago, Illinois
17. Colonial Metals Company, P.O. Box 311, Second & Linden Streets, Columbia, Pennslyvania 17512
18. Federal Metal Company, 7250 Division Street, Bedford, Ohio 44146
19. N. Kamenske & Company, Incorporated, Box 724, 5 Otterson Court, Nashua, New Hampshire 03061

(continued)

TABLE 2-3. (continued)

20. Kearny Smelting & Refining Corporation, 936 Harrison Ave., Kearny, New Jersey 07029

21. H. Kramer & Company, P.O. Box 7, No. 1 Chapman Way, El Segundo, California 90246

22. H. Kramer & Company, 1339-1345 W. 21st Street, Chicago, Illinois 60608

23. R. Lavin & Sons, Incorporated, 3426 S. Kedzie Avenue, Chicago, Illinois 60623

24. Liberman S. Gittlen Metal Company, Grand Rapids, Michigan

25. Milward Alloy Incorporated, Lockport, New York

26. Mishawaka Brass Manufacturing Incorporated, 1928 Mick Court, Mishawaka, Indiana 46544

27. National Metals, Incorporated, Box 102, Leeds, Alabama 35094

28. New England Smelting Works, Incorporated, 502 Union Street, West Springfield, Massachusetts 01089

29. North American Smelting Company, Marine Terminal, Wilmington, Delaware 19899

30. North Chicago Refining & Smelting Incorporated, 2028 S. Sheridan Road, North Chicago, Illinois 60064

31. Phelps Dodge Industries, Incorporated, Lee Bros., P.O. Box 1229, Anniston, Alabama 36201

32. River Smelting & Refining Company, P.O. Box 5755, Cleveland, Ohio 44101

33. Roessing Bronze Company, P.O. Box 60, Mars, Pennslyvania 16046

34. S-G Metals Industries, Incorporated, 2nd & Riverview, Kansas City, Kansas 66110

35. I. Schumann & Company, 22500 Alexander Road, Bedford, Ohio 44146

36. Sipi Metals Corp., 1720 N. Elston Avenue, Chicago, Illinois 60622

37. Specialloy Incorporated, 4025 S. Keeler Avenue, Chicago, Illinois 60632

TABLE 2-4. SECONDARY BRASS AND BRONZE FACILITIES SUBJECT TO THE NEW SOURCE PERFORMANCE STANDARD[5-9]

Plant/location	Furnace type/size	Compliance status[a]	Comments
American Brass, Inc. Headland, Alabama	2 rotary reverberatory/ 40,000 kg (88,000 lb)	In compliance[b]	Plant constructed in 1978
National Metals, Inc. Leeds, Alabama	1 rotary reverberatory/ 1,800 kg (4,000 lb)	In compliance	Furnace installed in 1977
Federal Metals, Inc. Bedford, Ohio	1 rotary reverberatory/ 18,000 kg (40,000 lb)	Not in operation	Furnace installed in 1981
I. Schumann and Co. Bedford, Ohio	1 rotary reverberatory/ 45,400 kg (100,000 lb)	In compliance	Furnace installed in 1982
Chase Brass and Copper Solon, Ohio	1 electric induction/ 10,000 kg (22,000 lb)	In compliance	Plant constructed in 1980

[a]Compliance with particulate matter and visible emission standards are determined by EPA Reference Methods 5 and 9, respectively (40 CFR 60, Appendix A).

[b]Visible emissions not determined during compliance testing.

plants are new plants (built since the NSPS was proposed), and three are existing plants that have installed new furnaces. Four of the plants have reverberatory (rotary) furnaces, and the fifth uses an electric induction furnace. All of the facilities are equipped with baghouses for emission control, and all operational facilities are currently considered to be complying with the NSPS.[5-9]

Even though there has been an increase in the past 4 years in the number of affected facilities subject to the NSPS, the industrywide production of ingot is declining.[16] Figure 2-1 shows the downward trend in the production of brass and bronze ingot as recorded by the Bureau of Mines in 1983.[16] Contacts with regional EPA offices and State and local air pollution control agencies revealed that some plants are closing and most are on reduced schedules.[17] The Brass and Bronze Ingot Institute attributes this decline to product substitutions and recently depressed economic conditions and does not expect growth in the industry in the foreseeable future.[18] However, additional affected facilities are expected to be installed by viable firms, despite this downtrend, to absorb capacity lost when other firms shut down; to provide production flexibility within a plant; to replace outdated, inefficient equipment; and to provide production facilities near market areas.[19,20]

2.3.2 Process Description

The brass and bronze manufacturing industry basically consists of three operations: raw materials collection and preparation, metal melting and ingot production, and metal product fabrication. The NSPS for secondary brass and bronze facilities is specific to furnaces used in raw material preparation and ingot production; therefore, fabrication will not be discussed in this review.

The following sections will discuss raw materials, material preparation, and melting as they relate to particulate emissions in the brass and bronze ingot production process.

2.3.2.1 Raw Materials. The raw materials used in the secondary brass and bronze ingot industry consist mainly of brass and bronze scrap. Both industrial and domestic scrap are used. Industrial scrap includes pieces, chips, and shavings of alloy materials, such as those which result from product fabrication. This scrap is free of impurities

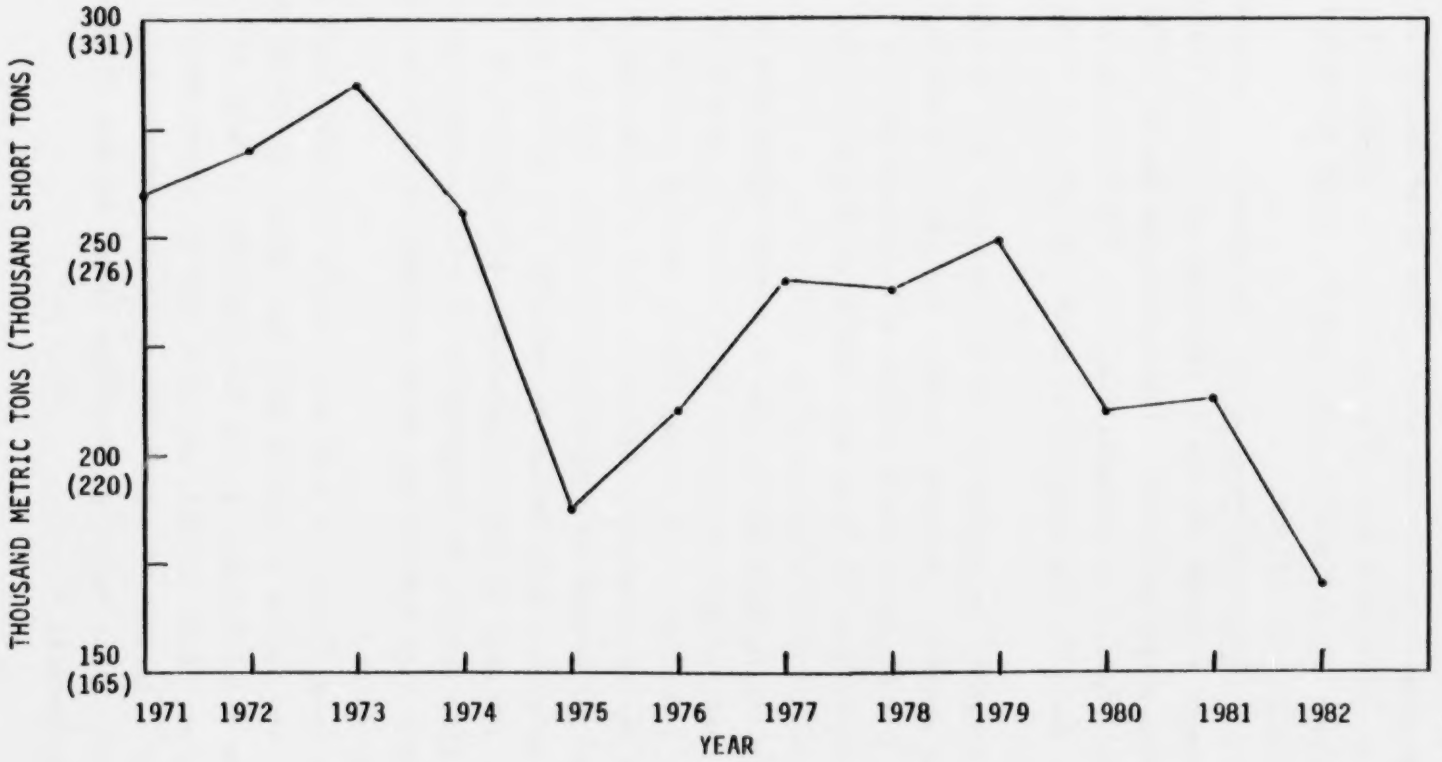

Figure 2-1. Brass and bronze annual ingot shipments, 1971-1982.[16]

and requires little preparation before charging into melting furnaces. Domestic scrap includes items that are being recycled, such as radiators, cartridge cases, and railroad boxes. This scrap usually contains significant amounts of undesirable materials, such as oil, grease, paint, insulation, and chemicals. For these reasons, domestic scrap may require cleaning before charging to furnaces.

2.3.2.2 Materials Preparation. The purpose of material preparation is to produce a charge for the furnace that will yield the desired alloy in the most effective manner. These processes may be either mechanical, hydrometallurgical, or pyrometallurgical. The first two processes are not considered in this description since they are not sources of particulate emissions.

Pretreatment by pyrometallurgical "methods" may include any of the following methods: sweating, burning, drying, blasting furnaces, and cupola. Use of any of these methods will produce particulate emissions; however, only blast furnaces and cupolas are subject to NSPS. A brief description of each method is given below.

Sweating furnaces may be used to remove low-melting point metals, such as lead, solder, and babitt metal. This is done by heating the scrap in a furnace, which causes the low-melting components to be separated from the desirable metals. Carefully controlled burning is usually performed for removal of insulation from wire or cable. Toxic substances such as polyvinyl chloride can be released during this process. Drying furnaces are used to vaporize substances such as cutting fluids from machine shop scrap. The temperature of this operation is critical since excessively high temperatures cause unwanted oxidation on the surface of the metal chips.[21]

The terms "blast furnace" and "cupola" are often used interchangeably. However, the cupola is used to melt down metals or reduce metal oxides, while the blast furnace is used for reduction of metal oxides or smelting virgin ores. Both furnaces are also used to recover metal from skimmings and slags. Because of the difference in the composition of the interacting atmosphere, these reducing operations cannot be done in reverberatory or refining furnaces.[22]

In both blast and cupola furnaces, coke is used as both fuel and reducing agent. The resulting product (black copper or cupola melt) is impure and must be refined to produce brass and bronze ingot. A schematic of a blast furnace is shown in Figure 2-2. The blast furnace and cupola operate on a continuous feed basis with charge material, coke, and fluxes introduced at the top. Finished metal is drawn from the bottom, generally on an intermittent basis. Slag is usually tapped on a continous basis through a separate spout at a level immediately above the metal pouring height.[23]

2.3.2.3 Melting. Brass and bronze are usually heated in large natural- gas- or oil-fired reverberatory furnaces or electric arc or induction furnaces. Indirect-fired furnaces are sometimes used for specific foundry applications but are not covered under the NSPS because of their small size and emission potential.

Any furnace in which the burner flames and/or hot gases come in direct contact with the charged material is considered to be a reverberatory furnace. Figure 2-3 is a schematic of a typical stationary reverberatory furnace. Reverberatory furnaces may also be the rotating, rocking, or tilting type. All reverberatory furnaces operate in the batch mode. The charge material and fluxes may be introduced before firing or may be added periodically throughout the heat. The fuel burned is either oil or natural gas.[23]

Stationary furnaces are usually larger, 100- to 200-Mg (110- to 220-ton) capacity, than the other types of reverberatory furnaces, which have capacities ranging from 18.9 to 45 Mg (1.0 to 50 tons).[5-8]

In all cases, when the charge attains the proper heat and impurities have been drawn off into the slag, the molten metal is tested for its alloy composition. Adjustments are made as needed, and the metal is brought to the ideal pouring temperature for the specific alloy by regulation of the fuel burners. At this point, metal pouring begins.[24]

Electric furnaces are mainly used for special purpose alloys. Major advantages of the electric furnace over fuel-fired furnaces are better furnace atmosphere control and high-temperature operation. Temperatures as high as 3300°C (6000°F) are possible for special processes. Heating may be accomplished by an arc, by induction, or by resistance

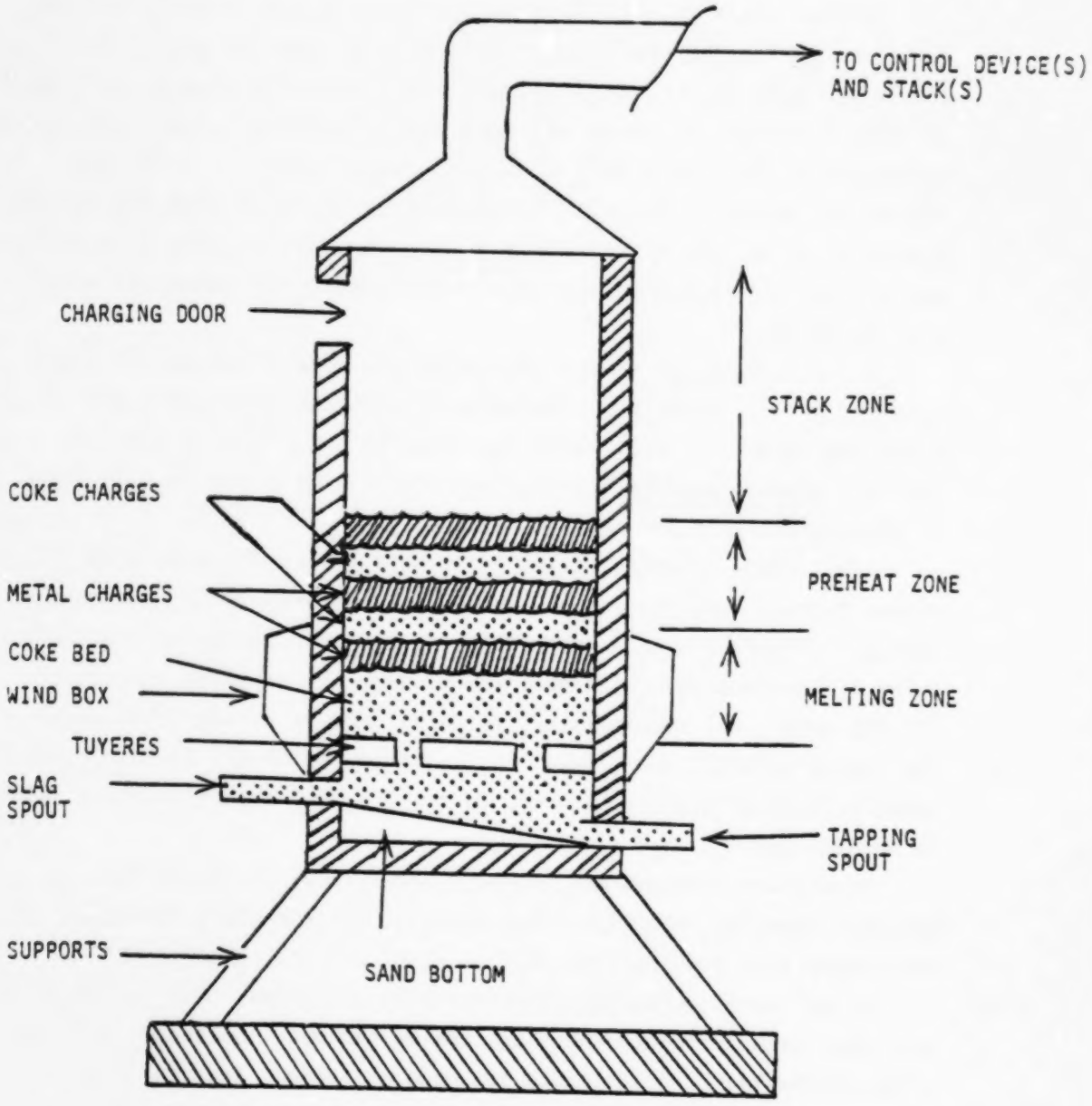

Figure 2-2. Schematic of a typical secondary metal blast furnace or cupola.

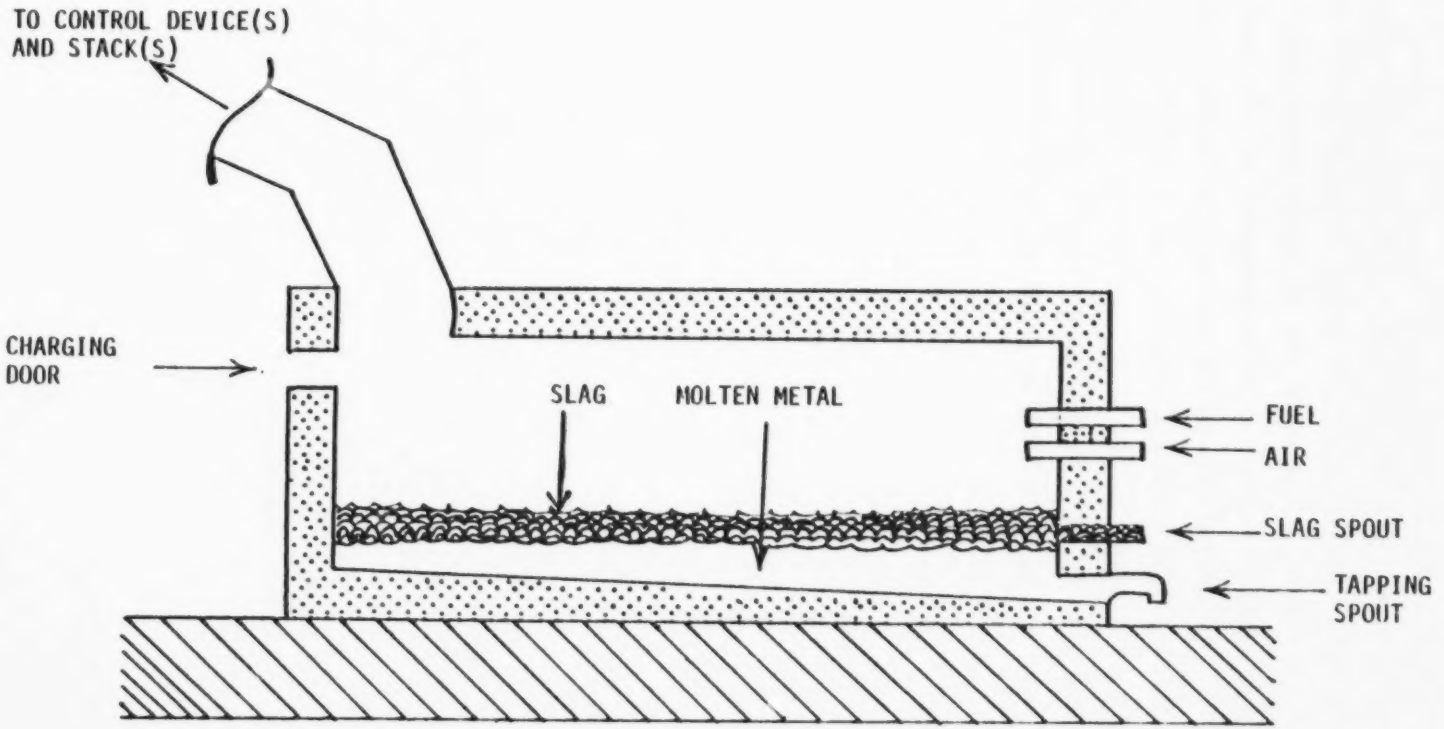

Figure 2-3. Schematic of a stationary reverberatory furnace.

(see Figure 2-4). In all cases, charging and pouring are generally done through the top of the furnace.[25]

Indirect-fired furnaces (crucible or pot furnaces) are usually significantly smaller than reverberatory furnaces and are similar in function to electric furnaces. Crucibles may be the tilting, pit, or stationary type and include the small, low-temperature pot furnaces. Charge materials are introduced through the top of the furnace along with inert fluxes. Finished alloys are removed from the furnaces through the top, either by tilting and pouring or by the use of ladles. Generally, crucible furnaces are used to heat metals up to 1300°C (2400°F). Pot furnaces are used only for temperatures up to about 760°C (1400°F).[27]

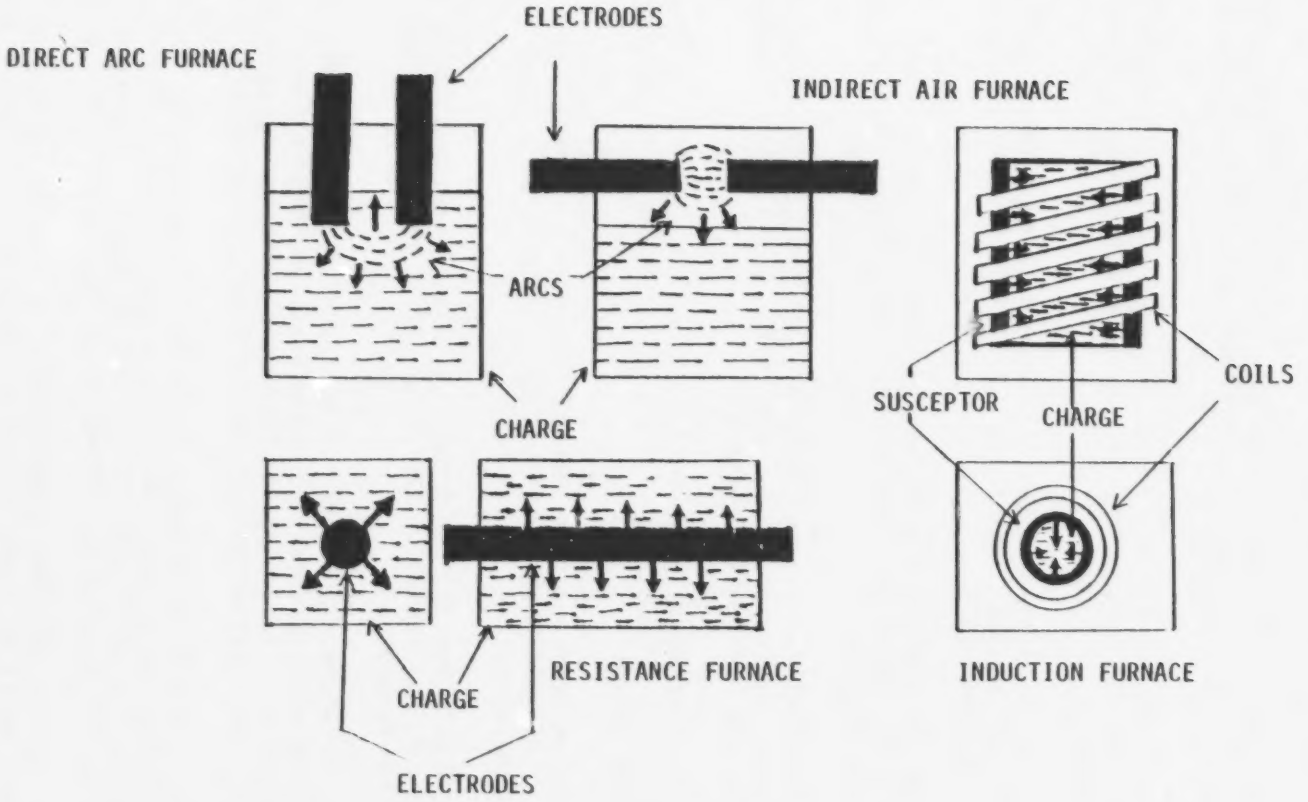

Figure 2-4. Electric furnace types.

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3. SUMMARY OF CURRENT STANDARDS

3.1 NEW SOURCE PERFORMANCE STANDARDS

3.1.1 Summary of New Source Performance Standards

The affected facilities under the NSPS for secondary brass and bronze ingot production processes are reverberatory and electric furnaces of 1,000 kg (2,205 lb) or greater production capacity and blast (cupola) furnaces of 250 kg/h (500 lb/h) capacity that were built, modified, or reconstructed on or after June 11, 1973.[1] The term "modified facility" applies to facilities to which physical or operational changes have caused an increase in the emission rate of any pollutant. The term "reconstructed facility" applies when the replacement cost of components exceeds 50 percent of the cost of building a comparable new facility (40 CFR 60).

Owners and operators of affected facilites are required to control particulate matter and limit opacity. The standards state that exhaust gases discharged to the atmosphere from revereberatory furnaces must not contain particulate matter in excess of 50 milligrams per dry standard cubic meter (mg/dscm) (0.022 grains per dry standard cubic feet [gr/dscf]), and must not exhibit 20 percent opacity or greater. The standards also state that exhaust gases from electric and blast (cupola) furnaces must not exhibit 10 percent or greater opacity. No mass emission standard for electric and blast (cupola) furnaces is included in the NSPS.

3.1.2 Testing and Monitoring Requirements

The owner or operator of an affected facility is required to conduct a performance test and furnish the Administrator with a written report of the test results.

Test methods to be used to determine compliance with the NSPS are:

1. Method 5 for the concentration of particulate matter and the associated moisture content;
2. Method 1 for sample and velocity traverses;
3. Method 2 for velocity and volumetric flow rate;
4. Method 3 for gas analysis; and
5. Method 9 for visible emission observations.

For Method 5, the sampling time for each run must be at least 120 minutes, and the sampling rate must be at least 0.9 dscm/h (0.53 dscfm). The Administrator may approve shorter sampling times when they are necessitated by process conditions.

Secondary brass and bronze plants are not required to use continuous monitoring systems.

3.2 STATE REGULATIONS

Secondary brass and bronze ingot production plants are currently operating in 13 States. Table 3-1 summarizes particulate emission regulations applicable in these States to new secondary brass and bronze ingot production processes in the absence of NSPS. The most stringently expressed State standard is 45 mg/dscm (0.02 gr/dscf) (New Jersey), which is slightly lower than the 50 mg/dscm (0.022 gr/dscf) limit for reverberatory furnaces established by the NSPS. Ohio, Michigan, Pennsylvania, and certain districts in California require the use of best available control technology (BACT) on new sources. This requirement has, in some cases, resulted in a State enforcing more stringent emission and opacity limits than those required by the NSPS.[2]

Using the process weight rate equation shown in Table 3-1, a furnace with a process weight rate of 0.9 Mg/h (1 ton/h) would be allowed to emit 1.9 kg/h (4.1 lb/h) per hour of particulate matter. By comparison, the NSPS limits these emissions to between 0.5 and 0.7 kg (1.0 and 1.5 lb) per hour (based on typical air stream flow rates in the secondary brass and bronze industry).[3]

All 13 States limit visible emissions to less than 20 percent opacity for new facilities and to 40 percent opacity or less for existing facilities. Most States have been delegated enforcement authority for

TABLE 3-1. SUMMARY OF STATE REGULATIONS FOR SECONDARY BRASS AND BRONZE PRODUCTION PROCESSES[5]

State	No. plants	Regulation
Alabama	4	$E = 4.1 \times P^{.67}$[b]
California[a]		
Bay Area	2	$E = 4.1 \times P^{0.67}$
SCAQMD[c]	1	Table 405(a)
Delaware[d]	1	Table (Reg. 5, Sec. 4.1, Type 2)
Illinois	6	$E = 4.1 \times P^{0.67}$
Indiana	2	$E = 4.1 \times P^{0.67}$
Kansas[d]	1	$E = 4.1 \times P^{0.67}$
Massachusetts	3	0.06 gr/dscf
Michigan[a]	2	$E = 4.1 \times P^{0.67}$
New Hampshire	1	$E = 4.1 \times P^{0.67}$
New Jersey	1	0.02 gr/dscf
New York	2	$E = 4.1 \times P^{0.67}$
Ohio[a]	7	$E = 4.1 \times P^{0.67}$
Pennsylvania[a]	4	0.02 to 0.04 gr/dscf (dependent on air flow)

[a] Require best available control technology (BACT) for new source.
[b] E = allowable emission rate in lb/h.
[c] P = process weight rate in tons/h.
[c] Reference 7.
[d] States that have not accepted NSPS delegation.

the NSPS for the secondary brass and bronze ingot production industry (see Table 3-1). Those States that have not accepted delegation of the NSPS, Delaware and Kansas, state that they do not have the money or personnel at this time to enforce the NSPS regulations.[4,5]

3.3 REFERENCES FOR CHAPTER 3

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4. STATUS OF CONTROL TECHNOLOGY

4.1 EMISSIONS POTENTIAL

4.1.1 Emissions From Materials Preparation

Pyrometallurgical processes (sweating, wire burning, drying, and using blast or cupola furnaces) all create air pollutants to some degree. Sweating is carried out at medium temperatures to remove low melting point metals such as lead, solder, and babbit metal from radiators and other scrap. Metal fume losses are very low; however, fume and combustion products of antifreeze residues, soldering salts, and hose connections can be released.[1] Discussions with State and local air pollution control agencies revealed that most companies are eliminating the need for sweating furnaces by being more selective in scrap selection or by introducing dirty scrap directly into the melting furnaces.[2,3]

The potential fugitive particulate matter emission factor for uncontrolled wire burning is 6.88 kg of particulate matter per megagram of scrap processed (13.75 lb/ton).[4] In addition, the emissions from this incineration process may contain significant amounts of hazardous and/or toxic substances such as reactive hydrocarbons, fluorides, and the combustion products of common polymers such as polyvinyl chloride.[2] Because wire burning is potentially a large source of particulate matter emissions as well as the other pollutants mentioned above, many secondary brass and bronze facilities no longer accept this type of scrap.[2]

A heated rotary dryer is often used to vaporize excess cutting fluids from machine shop chips or borings. This drying operation creates hydrocarbon emissions. The potential fugitive particulate matter emission factor for rotary dryers is the same as that for wire burning; however, the nature

of the combustion process determines the degree to which these emissions are oxidized.[4]

Preparation of materials in blast furnaces and cupolas results in emissions that are similar to emissions from the smelting/melting furnaces (discussed in the next section). However, since blast furnaces and cupolas are generally used to concentrate low-grade scrap, slag, and skimming, emissions from these sources have a higher percentage of nonmetallic particles than do emissions from smelting/melting furnaces.

4.1.2 Emissions From Smelting

Air pollutants emitted from secondary brass and bronze smelting furnaces consist of products of combustion, dusts, and metallic fumes. The particulate matter comprising the dust and fume load varies according to the fuel, alloy composition, type of furnace, melting temperature, and other operating factors. In addition to fly ash, carbon, and mechanically produced dust, furnace emissions generally contain fumes resulting from oxidation and condensation of the more volatile elements, including zinc, lead, and others. An analysis of the dust collected by a secondary brass and bronze plant baghouse indicated the presence of the following constituents:[5]

Component	Particulate composition, percent by weight
Zinc	45.0-77.0
Lead	1.0-12.0
Tin	0.3-2.0
Copper	0.05-1.0
Chlorine	0.5-1.5
Sulfur	0.1-0.7

Zinc and other fumes are 0.03 to 0.5 μm in diameter.[5]

Direct-fired furnaces of the reverberatory and rotary type produce larger quantities of metallic fumes, such as zinc and lead oxide, than do the indirect-fired furnaces. This is due to the introduction of the hot burner flames and gases directly on the charge, resulting in vaporization of larger quantities of the lower boiling point metals. Other factors causing relatively large concentrations of zinc fumes in furnace gases are discussed in the following sections.

The fuel used in the various furnaces can have important effects on the types of emissions from brass and bronze facilities. The use of oil requires careful control techniques to minimize pollutants such as smoke, soot, and unburned fuel particles. Gas is often more trouble-free, both in minimizing emissions and supplying the proper combustion conditions.

4.1.2.1 Charging. Charging emissions are dependent on the condition of the scrap, location of the charging doors, percentage of volatile alloy constituents, and upon whether the entire charge is made at the beginning of the heat or at intervals during the melt. Even if scrap has been pretreated to remove contaminants, particulate and unburned hydrocarbon emissions can still occur during charging. Overhead charging doors, used in stationary reverberatory furnaces (which are being replaced by rotary reverberatory furnaces) permit losses of hot gases, fly ash, and fume into the plant when charges are loaded at intervals during the heat. End and side charging doors in rotary-type furnaces permit significantly less escape of furnace gases during charging.[6] All reverberatory furnaces subject to the NSPS are rotary-type furnaces, which charge via end doors.

4.1.2.2 Melting. The furnace is closed for the meltdown process. Increased zinc oxide emissions can result from improper combustion, overheating of the charge, and heating the charge too fast.[7] The use of nonuniform scrap can also increase emissions.

4.1.2.3 Refining. Refining, a chemical process of purification, is that cycle of smelting in which impurities and other constituents of the charge, present in excess of specifications, are reduced or removed. Refining methods vary depending on the type of furnace, composition of the scrap, and the desired alloy, but the basic approach is the same for all. The chemicals used in refining, commonly termed fluxes, may be gaseous, liquid, or solid. Compressed air is the most extensively used flux. Blowing air into the molten metal bath causes a selective oxidation of metals in accordance with their position in the electromotive series. Air blowing also oxidizes the remaining impurities. The metal oxides are entrapped in the slag covering or entrained in the furnace exhaust gases. Nitrogen is sometimes used to remove gases and oxides or to mechanically and buoyantly lift foreign matter from the metal bath.

Zinc is partially oxidized during this process, but this is an unavoidable loss. Solid fluxes as a whole do not contribute to air pollution. Rather they have a generally beneficial effect on the quality of stack emissions by preventing excessive volatilization losses.[8]

4.1.2.4 Alloying. Alloy modifications are made during the heating process by the addition of virgin metals or scrap. This can cause an increase in fume emissions. The formation of fumes increases as the percentage of volatile constituents increases. Due to its very low boiling point, zinc is the most serious problem, with the rate of zinc loss being approximately proportional to the zinc percentage in the alloy.[7]

4.1.2.5 Pouring. Physical methods of pouring the molten alloy into molds vary; however, in all cases, metal oxide fumes are emitted when the hot molten metal is poured through the air. For a given percentage of zinc, an increase in temperature of 56°C (100°F) increases the rate of loss of zinc about three times.[7] Other dust may be produced, depending upon the type of linings or coverings associated with the mold as it is filled with hot molten metal.[9]

4.2 CONTROL TECHNOLOGY

4.2.1 Control of Particulate Matter Emissions During Charging, Melting, and Refining

Particulate matter emissions are captured with either side draft hooding or charging enclosures. There are three basic types of primary control equipment used to control this captured particulate matter from the exhaust gases of ingot production processes: wet scrubbers, ESP's, and baghouses. Of these, baghouses are BDT for reverberatory, electric, and blast (cupola) furnaces.

Of the 37 secondary brass and bronze plants currently in operation, 3 use only wet scrubbers, 1 uses wet scrubbers and ESP's, 1 uses an ESP, 1 uses wet scrubbers and baghouses, 30 use only baghouses, and 1 minor source is uncontrolled. All five plants having NSPS affected facilities use only baghouses as the primary means of particulate control (see Table 2-4). The infrequent use of wet scrubbers and ESP's is mainly due to their inability to remove metal fumes, such as zinc oxide, as efficiently

as baghouses can. Wet scrubbers typically are unable to provide the level of control required under the NSPS and have the disadvantages of relatively high power consumption, maintenance requirements, and water and solid waste pollution. Electrostatic precipitators have difficulty in collecting metal oxides because of the relatively high resistivity of such particles.[10]

Typical fabric filters used in the secondary brass and bronze industry have volumetric capacities ranging from 5 to 15 standard cubic meters of air per second (10,000 to 25,000 standard cubic feet per minute). The air-to-cloth ratio of baghouses used in the secondary brass and bronze industry can range from 1:1.5 to 5:1. Fabric filters typically have particulate removal efficiencies in excess of 99 percent and have relatively low pressure drop and power requirements.[10-15] Fabric filters are considered best demonstrated technology (BDT) for the control of particulate emissions in the secondary brass and bronze industry. Fabric filters on affected facilities are typically made of Nomex® and cleaned by the shaker method.

4.2.2 Control of Particulate Matter Emissions During Pouring

The NSPS does not apply during periods of pouring. Although specialized hooding systems, made of such materials as canvas, are used to capture these emissions, their effectiveness is limited. This is because personnel need access to the pouring area, thus preventing the optimum location of hoods. Observations made during plant visits indicate the magnitude of these uncaptured emissions is not significant.

4.2.3 Control of Unregulated Pollutants

The NSPS does not include specific limits for each pollutant emitted from secondary brass and bronze plants. Metal oxides such as lead oxide are the major unregulated pollutants. Control of metal oxides is efficiently accomplished with baghouse technology, which is currently BDT for particulate matter emission control.

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13. Letter and attachments from Oberlin, J. P., I. Schumann and Company, to Farmer, J. R., EPA:ESED. May 5, 1983. Response to Section 114 information request.

14. Letter and attachments from Sherman, G., American Brass, Inc., to Farmer, J. R., EPA:ESED. May 5, 1983. Response to Section 114 information request.

15. Letter and attachments from Brown, L., Chase Brass and Copper Co., to Farmer, J. R., EPA:ESED. April 12, 1983. Response to Section 114 information request.

5. EMISSION TEST RESULTS

5.1 ANALYSIS OF EMISSION TESTS

Since the NSPS was proposed on June 11, 1973, six facilities in five plants have become subject to its provisions. Two of these plants (American Brass, Inc., and Chase Brass & Copper in Solon, Ohio) were constructed since the NSPS proposal. Three plants (National Metals, Inc., Federal Metals, Inc., and I. Schumann & Company) have installed new furnaces. Particulate emission rates and visible emission readings from affected furnaces at these plants and from one electric furnace not affected (Chase Brass & Copper in Montpelier, Ohio) are given in Table 5-1 and are discussed below.

5.1.1 Reverberatory Furnaces

Furnaces subject to the NSPS at four of the five plants are the rotary reverberatory type. As can be seen from Table 5-1, each of the operating furnaces is in compliance with both the 50 mg/dscm (0.022 gr/dscf) particulate matter emission standard and the 20 percent visible emission standard. Plant visit to I. Schumann & Company confirmed the low opacity from their facility.

5.2.1 Electric, Blast, and Cupola Furnaces

Currently one electric furnace (at Chase Brass & Copper) and no blast or cupola furnaces are subject to the NSPS. Table 5-1 shows the electric furnace is in compliance with the 10 percent opacity limit. A plant visit to Chase Brass & Copper (Solon, Ohio) verified the low opacity of emissions from this facility. The particulate emission rate from this affected facility is well below the 50 mg/dscm (0.022 gr/dscf) emission limit applicable to reverberatory furnaces. The particulate emission rate from an electric furnace (at Chase Brass & Copper, Montpelier,

TABLE 5-1. EMISSION TEST RESULTS OF SECONDARY BRASS AND BRONZE FACILITIES[a] [1-8]

Plant/location	Furnace type	Emission rate[b] mg/dscm (gr/dscf)	Percent[b] opacity	Control technology	Compliance status
American Brass, Inc. Headland, Alabama	Reverberatory Reverberatory	41.8 (0.0184)[c] 41.8 (0.0184)	-- --	Baghouse Baghouse	In compliance In compliance
National Metals, Inc. Leeds, Alabama	Reverberatory	4.5 (0.002)	0	Baghouse	In compliance
Federal Metals, Inc. Bedford, Ohio	Reverberatory	Not yet tested		Baghouse	Not yet tested
I. Schumann & Co. Bedford, Ohio	Reverberatory	5.5 (0.0024)	0	Baghouse	In compliance
Chase Brass & Copper Solon, Ohio	Electric induction	12.8 (0.0056)	0	Baghouse	In compliance
Chase Brass & Copper Montpelier, Ohio	Electric induction	0.7 (0.0003)	Not determined	Baghouse	Not subject to NSPS

[a]NSPS: Reverberatory--50 mg/dscm (0.022 gr/dscf) and 20 percent opacity.
Electric induction--10 percent opacity.

[b]Emission rate and opacity determined by EPA Reference Methods 5 and 9, respectively, except where noted.

[c]Subsequent to this performance test, opacity problems were observed at the baghouse outlet; the fabric filter has been rebagged. However, no new performance test has been conducted to quantify any change in performance.

Ohio) not subject to the NSPS is also presented. The particulate emission rate from this facility is also well below the emission limit applicable to reverberatory furnaces.

5.2 OTHER ATMOSPHERIC EMISSIONS

None of the plants having affected facilities pretreat the scrap before charging. All five plants use a charging material containing less than 10 percent lead, two reporting only trace amounts of lead in the charging material. Cadmium, mercury, arsenic, and chromium are reported to be present in only trace amounts in charging material for all affected facilities.[9-13]

5.3 WATER DISCHARGES AND SOLID WASTE GENERATION

No wastewater discharges are produced by the plants having affected facilities. Solid waste products including zinc oxide (baghouse dust) at all affected facilities and slag at one affected facility are collected and sold.[9-13]

5.4 REFERENCES FOR CHAPTER 5

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7. Letter and attachments from Seaman, D., Cleveland Division of Air Pollution Control, to Atkinson, D., MRI. April 13, 1983. Source test results for I. Schumann & Co., and Chase Brass and Copper.

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13. Letter and attachments from Brown, L., Chase Brass and Copper Co., to Farmer, J. R., EPA:ESED. April 12, 1983. Section 114 information request.

6. COST ANALYSIS

The purpose of this chapter is to present updated capital and annualized costs for control systems used to achieve the NSPS and to discuss the cost effectiveness of any proposed changes to the NSPS. To estimate the economic consequences of the NSPS, model plant descriptions were developed to serve as a basis for estimating costs. The model plant descriptions are summarized in Table 6-1 and are representative of plants currently subject to the NSPS.[1-5] No model plant description is presented for blast (cupola) furnaces because none are currently subject to NSPS or are expected to become subject in the future. The updated costs, including capital costs and annualized costs, of control equipment for typical affected facilities are also shown in Table 6-1. These costs were updated to December 1982 dollars using the Chemical Engineering plant cost index and company data.[1-6]

The capital cost of a control system includes all the cost items necessary to design, purchase, and install the particular device or system. The capital cost includes the purchased costs of the major control device and auxiliaries such as fans and instrumentation; the equipment installation cost including foundations, piping, electrical wiring, and erection; and the cost of engineering construction overhead and contingencies.

The annualized cost of a control system is the cost to the company to own and operate the system. The annualized costs include direct operating costs, such as labor, utilities, and maintenance; and capital related charges, such as depreciation, interest, administrative overhead, property taxes, and insurance.

6.1 REVERBERATORY FURNACES

Most States use the same process weight equation to establish a mass emission standard of approximately 63.6 mg/dscm (0.028 gr/dscf) for reverberatory furnaces. Because this is so near the level of the NSPS, there is unlikely to be a discernable difference in the emission rate of a furnace complying with the typical State limit and an otherwise identical furnace complying with the NSPS. The capital and annualized costs of air pollution control equipment and associated ductwork, pumps, etc., necessary for a typical plant to meet either the most common SIP or the NSPS are approximately $514,000 and $190,000, respectively (see Table 6-1).

Because there is no significant difference in either the emission rates or control equipment costs for facilities meeting the predominant State standard and those complying with the NSPS, there is no incremental cost effectiveness. However, the cost effectiveness of the NSPS and predominant State limit compared to uncontrolled is estimated to be $135 per ton based on the uncontrolled emission factor given in AP-42.[7]

6.2 ELECTRIC FURNACES

Most States apply the same process weight equation used to determine emission limits for reverberatory furnaces to also determine emission limits for electric furnaces. Since typical electrical furnaces process brass and bronze at the same rate as typical reverberatory furnaces, the same predominant State standard applies, 63.6 mg/dscm (0.028 gr/dscf). Because this mass emission standard is based on the use of the same control technology as the 10 percent visible emission limit under the NSPS, no additional capital expenditures are necessary to meet the NSPS limit over those necessary to comply with these State requirements.

If the same mass emission limit set by the NSPS for reverberatory furnaces were applied to electric furnaces, no additional capital expenditures beyond those necessary for typical SIP compliance would be required since the two standards would limit emissions to essentially the same level. The capital and annualized costs for control to meet either the most common SIP or the NSPS reverberatory limit are approximately $290,000 and $135,000, respectively (see Table 6-1). Because there would be no significant difference in either capital costs for air pollution control equipment or emission rates for identical furnaces under the NSPS and

TABLE 6-1. MODEL PLANTS[a]

Furnace type	Size,[b] Mg (tons)	Air flow,[b] acmm (acfm)	Control device[b]	Capital cost,[c] $	Annualized cost,[c] $	Emissions: Uncontrolled[d] mg/yr (ton/yr)	Emissions: Allowable[e] mg/yr (ton/yr)
Rotary reverberatory	45 (50)	1,200 (42,000)	Fabric filter	514,400	189,800	1,310 (1,440)	11 (12)[f]
Electric induction	45 (50)	500 (18,750)	Fabric filter	290,400	135,300	87 (96)	6 (7)[g]

[a] For more detail refer to reference 8.
[b] Based on typical operations of plants currently subject to the NSPS.[1-5]
[c] Calculated using industry information and the GARD manual.[9] Costs have been updated to December 1982 using Chemical Engineering economic indicators.[6]
[d] Assume an emission factor for rotary of 300 lb/ton; for electric induction assume 20 lb/ton.
[e] Assume 0.022 gr/dscf standard for both furnace types.
[f] Assume air flow of 28,000 scfm; 4,600 h/yr of operation.
[g] Assume air flow of 17,000 scfm; 4,600 h/yr of operation.

the predominant SIP, there would be no incremental cost effectiveness. The cost effectiveness of either the most common SIP or the NSPS reverberatory limit applied to electric furnaces is estimated to be $1,500 per ton compared to uncontrolled. This value is based on the AP-42 emission factor for uncontrolled electric furnaces.[7]

6.3 RETROSPECTIVE ANALYSIS OF ORIGINAL ECONOMIC IMPACT PROJECTIONS

The original economic impact analysis of the NSPS, performed in 1973 by the EPA, used a "model plant" approach. Three reference furnace sizes were distinguished: 20, 50, and 75 tons.

Representative income statements for the model plants were developed in the original analysis using representative values for plant operating hours, investment requirements, operating costs, and product prices. The annualized and capital control cost estimates were compared to the income statement items to estimate impacts in terms of: the percent reduction in earnings and cash flow (assuming all costs are absorbed), the percent increase in prices (assuming all costs are passed on), and the increase in new plant investment requirements.

Reductions in earning and cash flow were determined by the addition of NSPS control costs to the baseline operating costs of each plant and recalculating earnings and cash flow after tax. The percent price increases were estimated through the expression of annualized control costs as a percent of model plant revenues.

The findings of the original analysis were that the economic impact of the NSPS on affected brass and bronze plants would be very small. If all costs were to be paid by the firms rather than passed to their customers in the form of increased prices, earnings would decline by about 5 or 6 percent while cash flow would decrease about 1 or 2 percent. More likely, however, prices would be increased, and the extent of such price increases would be about 0.4 percent.

A retrospective analysis of the economic impact of the NSPS on the brass and bronze industry was conducted in 1983 as part of this review.[10] The review was conducted to judge the accuracy of the original EPA analysis and to project future (5-year) economic impacts of the NSPS on the brass and bronze industry. New costs were not obtained during the

review; rather the original EPA estimates were updated using appropriate indices.

The findings of this analysis are:

1. An analysis of brass and bronze price trends during the 10 years preceding proposal of the NSPS and extending through the 7 years following proposal of the standards, indicates that NSPS cost impacts have not contributed to price escalation in the brass and bronze industry (see Table 6-2).

2. However, the control costs associated with the standard resulted in a product price increase of 0.4 percent for typical furnaces. The product price impact will remain at this level in the near future (next 5 years), assuming that the standard will not be changed from its form as promulgated in 1974.

3. In recent years, the rate of decline in brass and bronze production has become smaller, indicating that the rate of decline in total industry output has not been accelerated by the NSPS.

TABLE 6-2. PRICES FOR BRASS AND BRONZE INGOTS[10]
(Cents per pound)

Year	Current[a]	Price index[b]	Constant[c]
1963	32.00	91.3	100.38
1964	35.14	93.8	107.29
1965	41.02	96.4	121.87
1966	50.34	98.8	145.92
1967	44.79	100.0	128.28
1968	44.26	102.6	123.55
1969	51.92	108.5	137.05
1970	56.35	116.6	138.41
1971	52.94	118.7	127.73
1972	51.90	123.5	120.36
1973	66.02	132.8	142.38
1974	84.49	171.9	140.77
1975	65.87	185.6	101.64
1976	70.03	195.9	102.38
1977	69.68	209.0	95.48
1978	72.76	227.1	91.76
1979	92.75	259.3	102.44
1980	106.11	286.4	106.11

[a]Prices not adjusted for inflation.[11]
[b]Reference 12.
[c]Prices adjusted for inflation and expressed in 1980 dollars.[13]

6.4 REFERENCES FOR CHAPTER 6

1. Letter and attachments from Sherman, G., American Brass, Inc., to Farmer, J. R., EPA:ESED. May 5, 1983. Response to Section 114 information request.

2. Letter and attachments from Horton, T., National Metals, Inc., to Farmer, J. R., EPA:ESED. May 9, 1983. Response to Section 114 information request.

3. Letter and attachments from Singh, A., and M. Sabatka, Federal Metals, Inc., to Farmer, J. R., EPA:ESED. May 9, 1983. Response to Section 114 information request.

4. Letter and attachments from Oberlin, J. P., I. Schumann and Co., to Farmer J. R., EPA:ESED, May 5, 1983. Response to Section 114 information request.

5. Letter and attachments from Brown, L. G., Chase Brass and Copper Co., to Farmer, J. R., EPA:ESED. April 12, 1983. Response to Section 114 information request.

6. Economic Indicators: Chemical Engineering. May 16, 1983. p. 7.

7. U.S. Environmental Protection Agency. Compilation of Air Pollutant Emission Factors, Third Edition, Supplement No. 9. Office of Air and Waste Management, Research Triangle Park, N.C. EPA Publication No. AP-42. July 1979. p. 7.9-5.

8. Memorandum from Keller, P., and D. Atkinson, MRI, to Iversen, R., EPA:ISB. May 31, 1983. Tabular cost memo for secondary brass and bronze NSPS review.

9. R. B. Neveril, GARD, Inc. Capital and Operation Cost of Selected Air Pollution Control Systems. U.S. Environmental Protection Agency. Research Triangle Park, N.C. EPA Publication No. EPA-450/5-80-002. December 1978. pp. 3-11 to 3-14, 3-17, 4-36, 4-37, 4-39, 4-22, 4-29, 4-30, 4-35 to 4-37, 4-46, 4-58, 4-50, 4-59, 4-61, 4-66, 4-73, 5-26, 5-32, B-2.

10. JACA Corporation. Retrospective Analysis of the Economic Impact of NSPS in the Brass and Bronze Industry. Prepared for U.S. Environmental Protection Agency. Research Triangle Park, N.C. Project No. EPA 68-02-3812. June 1983.

11. American Metals Market. "Metal Statistics 1981." Page 83. Average annual prices for 85-5-5-5 brass ingot.

12. Council of Economic Advisors. "Economic Report of the President." February 1983. Producer price index for metals and metal products. p. 231.

13. Telecon: Keller, P., MRI, with Castello, T., JACA Corp. July 27, 1983. Information concerning the JACA retrospective analysis of the economic impact of NSPS in the brass and bronze industry.

7. ENFORCEMENT ASPECTS

All five facilities subject to the NSPS are currently in compliance with the NSPS and applied State regulations. Company personnel contacted on plant visits and in writing indicated that they have no problems complying with the NSPS. Discussions with EPA regional offices and State and local agencies indicate that there are no major problems in enforcing the NSPS for the secondary brass and bronze industry.[1-3]

Of the five facilities currently subject to the NSPS, two are located in Alabama and three are located in Ohio (see Table 2-4). Both States have accepted delegation of enforcing the NSPS for the secondary brass and bronze industry. Plants operating in Alabama are required to use sound engineering emission capture practices to control particulate matter emissions.[1] New plants operating in Ohio are required to comply with the State's BACT standard in addition to any applicable NSPS. In accordance with this standard, new electric furnaces in brass and bronze plants are required to meet the 50 mg/dscm (0.022 gr/dscf) mass standard, currently only applied to reverberatory furnaces under the NSPS. New facilities are also required by Ohio to meet the opacity limit evidenced during the compliance test, resulting in a 0 percent opacity standard for the two operational facilities.[2] Ohio and Alabama personnel stated that continuous monitoring and reporting are not necessary at this time.[4,5]

The NSPS is written to cover reverberatory, electric, and blast (cupola) furnaces that are used in brass and bronze ingot production plants. One prototype facility, located in Ohio, uses an electric furnace to continuously cast rod instead of batch casting ingot. The State of Ohio considers this furnace to be subject to the NSPS.

The NSPS does not cover fugitive emissions; however, both Alabama and Ohio require specialized hooding for the capture of these emissions,

which are ducted to a common baghouse with affected facilities. Emissions from these baghouses are required to meet NSPS and State standards.

7.1 REFERENCES FOR CHAPTER 7

1. Telecon. Keller, P., MRI, with Wood, B., Alabama Air Pollution Control Commission. April 14, 1983. Alabama enforcement of NSPS and State standards.

2. Memo from Keller, P., MRI, to Iversen, R., EPA:ISB. April 18, 1983. Minutes of meeting with Cleveland Division of Air Pollution Control.

3. Telecon. Keller, P., MRI, with Moore, B. EPA:Region IV. February 10, 1983. Compliance status of secondary brass and bronze facilities in Region IV.

4. Telecon. Keller, P., MRI, with Wood, B., Alabama Air Pollution Control Commission. May 12, 1983. Alabama monitoring and reporting requirements.

5. Telecon. Keller, P., MRI, with Seaman, D., Cleveland Division of Air Pollution Control. May 13, 1983. Ohio monitoring and reporting requirements.